

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2017/2018

POC0335 – ORGANIC CHEMISTRY

(Foundation in Life Sciences students only)

4 June 2018
2.30 p.m. – 4.30 p.m.

(2 Hours)

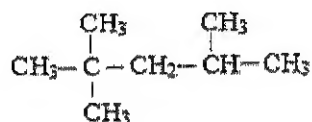
INSTRUCTIONS TO STUDENT

1. This question paper consists of 5 pages only excluding the cover page.
2. Answer **ALL** questions.
3. Please write all your answers in the answer booklet provided.
4. Distribution of marks for each question is given.

Instructions: Answer ALL questions.

Question 1 [10 marks]

- a. How many primary, secondary, tertiary and quaternary carbon atom are there in the following molecule? [4 × ½ mark]

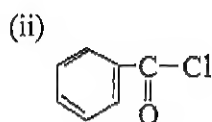
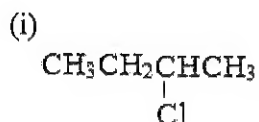


- b. Give the structural formulae of the products formed when 2-methyl-2-butene reacts with: [2 × 1 mark]
- (i) hydrogen in the presence of platinum
(ii) steam in the presence of phosphoric acid
- c. (i) Give the formulae of the three structural isomers of an alkene with the molecular formula of C_4H_8 . [1 mark]
(ii) One of the above isomers shows a type of stereoisomerism. Draw the structure of the stereoisomers and suggest how these stereoisomers can be distinguished. [2 marks]
- d. Show by giving equations and conditions for the conversions of 1-propanol to 2-propanol. [2 marks]
- e. Arrange the following compounds in order of increasing boiling points. Explain your answer. [1 mark]
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$, $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$

Continued.....

Question 2 [10 marks]

- a. Give the structures of the monosubstituted products formed when benzene is treated with the following under suitable conditions. [2 × 1 mark]



- b. Write equations (show structures) for these reactions.

- (i) oxidation of 4-ethyl-methylbenzene with hot acidified $\text{K}_2\text{Cr}_2\text{O}_7$ [1 mark]
(ii) conversion of benzene to benzoic acid [2 marks]

- c. Correct the following incorrect names: [3 × 1 mark]

- (i) 2,4,6-tribromobenzene
(ii) 3-hydroxynitrobenzene
(iii) para-methylbromobenzene

- d. Normally, benzene gives electrophilic substitution reactions rather than electrophilic addition reactions although it contains double bonds. Explain briefly about this statement. [1 mark]

- e. Nitration reactions of aromatic system usually give only one mononitro substitution product even when an excess of nitrating reagent is used. Explain briefly about this statement. [1 mark]

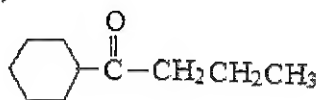
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Question 3 [10 marks]

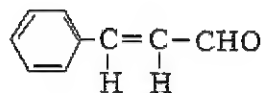
a. Give IUPAC name for the following compounds:

[4 × 1 mark]

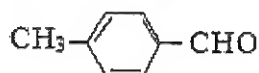
(i)



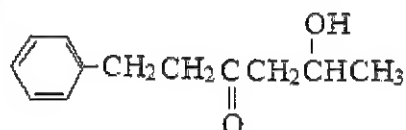
(ii)



(iii)



(iv)



b. Draw the structures of aldehydes or ketones that give these alcohols on reduction with lithium aluminium hydride.

[3 × 1 mark]

(i) 2-phenylethanol

(ii) 2,5-heptadiol

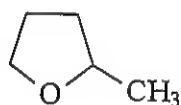
(iii) 4-chlorophenylmethanol

c. Compare briefly the physical properties (boiling point and solubility in water) of aldehydes and ketones with other nonpolar compounds of comparable molecular weight.

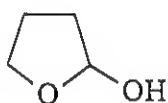
[1 mark]

d. Which of the following compounds are acetals?

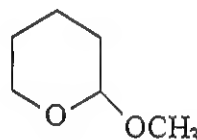
[1 mark]



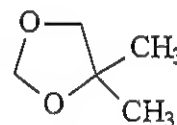
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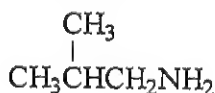
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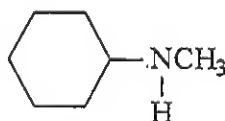
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e. Identify the secondary amines from the following structures:

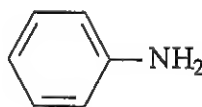
[1 mark]



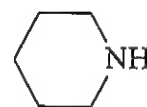
(1)



(2)



(3)

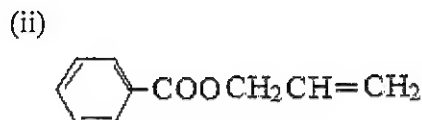
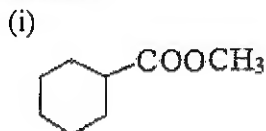


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Question 4 [10 marks]

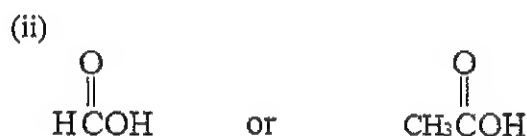
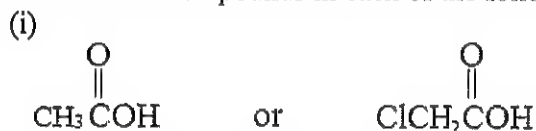
- a. Name the carboxylic acids and alcohols from which each of the following ester is derived. [2 × 1 mark]



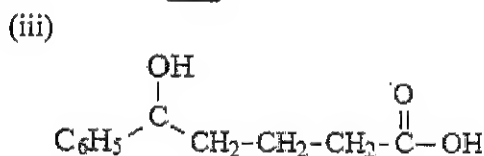
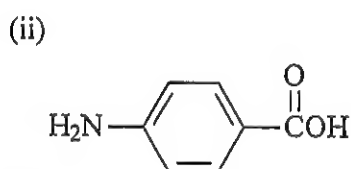
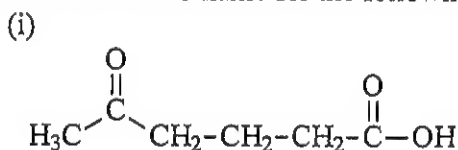
- b. Draw the structures of the organic products in the following reactions. [3 × 1 mark]

- (i) 4-chlorobenzoic acid with aqueous sodium hydroxide.
(ii) 2-chlorobenzoic acid with aqueous sodium carbonate
(iii) ethanoic acid with ammonia

- c. Which of the compounds in each of the following pairs is more acidic? [2 × ½ mark]



- d. Give the IUPAC name for the following structures: [3 × 1 mark]



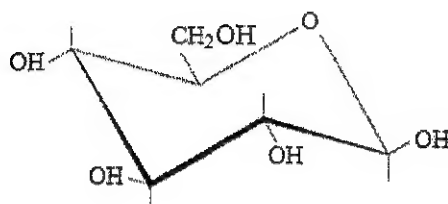
- e. Carboxylic acids have higher boiling points than other types of organic compounds of comparable molecular weight. Explain briefly about this statement. [1 mark]

Continued.....

Question 5 [10 marks]

- a. Convert the chair conformation below to a Haworth projection (draw only the β -anomer) and then to a Fischer projection (draw only the D-monosaccharide).

[2 × 1 mark]



- b. For the following mixtures of amino acids, predict the direction of each component during electrophoresis. [Isoelectric point: glutamic acid = 3.08; phenylalanine = 5.48; valine = 5.96; histidine = 7.59]

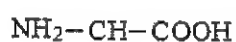
[2 × 1 mark]

- (i) Glutamic acid and phenylalanine at pH 5.0.
(ii) Valine and histidine at pH 7.59.

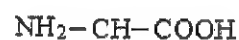
- c. Much research has been carried out in recent years investigating the exact structure of silk. A silk fibre is composed of many identical protein chains, which are mainly made from the amino acids glycine, alanine and serine, with smaller amounts of four other amino acids.



Glycine



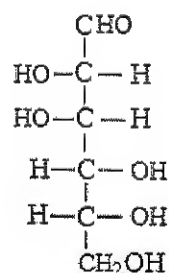
Alanine



Serine

- (i) Amino acids can exist as zwitterions. Draw the zwitterionic structure for glycine. [1 mark]
(ii) Draw the structural formula of a portion of the silk protein, showing three amino acid residues (Gly-Ala-Ser). Label a peptide bond on your structure. [2 marks]
- d. Figure below shows the structure of D-Mannose. Draw structures for the products you would expect to obtain from the reaction of D-Mannose with each of the following reagents. [3 × 1 mark]

- (i) NaBH_4
(ii) Oxidizing agent in basic solution
(iii) Enzyme-catalyzed oxidation

**End of Paper**